NOTES ON THE SPECIES OF LACHNOSTERNA OF TEMPERATE NORTH AMERICA, WITH DESCRIPTIONS OF NEW SPECIES.

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(With Plates XLVIII—LX.)

Few genera containing large species, or insects of even average size, have been for so long a time in a chaotic state as the genus *Lachnosterna*. Abundant everywhere in early summer, the insects were largely looked upon as nuisances by collectors because, first, they looked very much alike, and second, because no one seemed to know exactly what names to put on them. The collector who pinned up large series, and obtained specimens from correspondents, soon came to the conclusion that not only were there numerous species, but there were numerous names for every species, and they gradually became resigned to a mass of material that might contain many or few species. There is a distressing similarity of color, form, and size throughout the genus, and yet quite sufficient individual variation in each of these points to make specific recognition in some groups all but impossible. Perhaps not more than two or three collections were correctly named a few years ago, and one of these was the type collection of Dr. Leconte.

In my early, enthusiastic days, when it seemed easy to straighten out all that was crooked in entomology, *Bembidium* and *Lachnosterna* among the Coleoptera attracted my especial attention, and I gathered in material from all sources, until I thought I had enough, and then on the occasion of a visit to Dr. Horn, announced my intention of working up these genera. Dr. Horn kindly showed me his material, and opened box after box to my astonished vision, quietly discussing the characters requiring study, and the literature that must be consulted. Needless to say that when I left Dr. Horn's collection I was thoroughly cured of my ambition, at least so far as *Bembidium* and *Lachnosterna* were concerned. Thereafter I contented myself with accumulating material.

Recently, in the Transactions of the American Entomological Society, XIV, pp. 209–296, Dr. Horn has redeemed a long-standing promise, and given us a revision of the species of *Lachnosterna*, which has rendered possible an intelligent collection and arrangement of the species. Upon this paper the following notes are based.

While working on the genus, Dr. Horn visited the Museum, and looked over such of the material as I could gather together at short notice, naming many species, and pointing out their salient characters. He also kindly offered to determine all of our material if sent him. Accordingly Professor Riley directed me to look out, arrange, and send series of all

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our species to Dr. Horn. This I did, and the specimens were promptly returned. The most casual glance over the returned material showed that I had failed to discover the specific characters in my superficial arrangement of the series, and the material was left intact until the appearance of Dr. Horn's paper.

When this at last came to hand, it was an easy task with the book and named specimens to correctly determine all of the unnamed material. In order to familiarize myself with the characters used, I carefully compared each species with its description, and noted the variations observed. As I found that our material covered a wider territory than that seen by Dr. Horn, I added localities and, so far as our specimens showed them, dates of capture as well. Without any definite idea in making these notes, it occurred to me that they might be useful in a list of the species contained in the Museum collection.

Our material was remarkably rich in specimens and species. My own collection, purchased by the Museum, contained a full representation of forms found around New York City, and many lots obtained in bulk by exchange from all parts of the country.

The Riley collection donated to the Museum, was rich in material from Texas and the Mississippi Valley, and especially valuable because much of it was dated, or contained other information on the labels.

From the Morrison collection, purchased for the Museum, we had long series of several species, principally from North Carolina. Finally, in the Department of Agriculture and Museum collection proper, there were many specimens from all parts of the country sent in by correspondents or because of injuries caused by them.

The fauna of the District of Columbia was not very well represented, and to obtain full series of local species, and to gather information on food habits, dates of appearances, etc., Mr. Schwarz and myself determined to make a series of collections and observations—a work which first induced the idea of this paper from the results of our observations; results not at all anticipated when we started collecting.

The arrangement of the *fusca* group, or more correctly the union of forms under the specific term *fusca*, by Dr. Horn did not strike me as entitled to be called final; the less so, as Dr. Horn evidently was not quite satisfied himself, and we were in hopes of finding some more satisfactory limit for the species. In all these points we were successful, as the following will show.

I desire here to acknowledge my indebtedness to Mr. E. A. Schwarz for his aid in collecting specimens, for his pertinent suggestions, and for assistance in the work of ascertaining the range of the species. Messrs. Pergande and Alwood, of the Department of Agriculture, joined in many of the evening excursions and kindly placed at my disposal all the material obtained by them. Mr. C. H. Roberts, visiting Washington at that time, also joined me in the collections made near my own house, and together we found many species. Mr. Ulke, who, while the

others were haunting the woods, collected at the electric light and gave many specimens for the purposes of study, also deserves my thanks. Professor Riley, by his kind permission to use the Museum material, and the suggestions offered, has materially added to the completeness of the paper. Finally Dr. Horn has my sincere thanks for the liberality which induced him to place even unique types at my disposal for the study of the genitalia. I am happy to say that I did not in any way injure a single specimen. In addition to the material from the sources above enumerated, I have also received and studied numerous lots of specimens sent me by correspondents from all parts of the United States, so that I believe that I have seen and carefully examined more specimens of *Lachnosterna* than even Dr. Horn in his original study of the genus.

In the course of our collections I first noted in specimens taken *in coitu* a difference in the appearance of the male genitalia. I am aware that in a somewhat fragmentary way the genitalia of some genera of Coleoptera have been studied in Europe, and that a few of our *Scarabæidæ* also have been studied in connection with European species, but I have made no exhaustive study of the literature of this subject. In this country Dr. Horn has made use of the sexual structures in his study of the species of *Corphyra*, but, so far as I am aware, no other American author has made anything like a systematic attempt at their study.

The positive results seen by me in my studies of these organs in the Lepidoptera led me to a careful examination of them in the species here, in the hope that here might be the character by which the species of the *fusca* group could be finally and satisfactorily separated. The hope was realized even more fully than I had expected, and the great differences found in the males led to an examination of the females for correlated structures, which proved as distinctive as those of the male, and which, so far as I am aware, have not been hitherto studied.

A striking character in the males of many species is the remarkable asymmetry of the organs, for which I can not find an entirely satisfactory reason, and to which there seems to be no exact correlation of female structures. I shall, further on, give the only explanation that I have been able to find—whether sufficient or not I can not at present be sure. I shall not endeavor to make any generalizations from the characters described, fully realizing that it is much too soon for that. I simply wish to add some information regarding the characters of the species, and to record my ideas as to the standing of others. The characters afforded by the genitalia of both male and female will, I am convinced, be more and more used in the future to decide questions of specific identity. Perhaps it may be of interest to quote from Dr. Kraatz on this subject, Dr. Kraatz having worked considerably and well in this line. He says (Deutsche Ent. Zeitschr., 1881, v. 25, p. 116):

(1) Larger, natural groups, show a typical form of *penis*, but not always.

(2) The naturalness of certain genera can often be demonstrated by the peculiar formation of the *penis*, where there is a lack of other striking characters; it is a supplementary character of great value.

(3) Most species, and often very similar ones, show great, often remarkable, differences in the structure of the *penis*.

To these conclusions my studies induce me to give full consent, save that the first may be subject to some further modifications or limitations. This paper by Kraatz gives a very fair and well-written review of the literature of the study of the genitalia, and is well deserving of careful reading by all interested in the study of these structures. I would emphasize in addition to the conclusions above cited that the characters are invariable within specific limits, and that while identity of genital structure is not always indicative of specific identity, difference of this structure is always indicative of specific difference.

Lacordaire is said to have called these structures the "key to species," and, while hardly willing to accept that dictum to its full extent, it certainly has proved so in *Lachnosterna*.

The rather remarkable result reached in the study of these organs in the forms allied to *fusca*, and confounded under the same name, may seem indicative of a tendency to a too minute subdivision of forms upon internal structures; but here I only emphasize by them the external characters which otherwise would warrant only Dr. Horn's conclusions that they are individual, evanescent, and scarcely varietal. The fact that in some localities two or more of the forms occur together will make it necessary to collect more carefully and in larger series, and also to devote more study to the separation of the species.

The correlation of the ♀ parts to the ♂ structures will make it necessary to devote more attention to this sex in the future, and there is no reason why, with a fresh specimen, determination from that sex should not be as absolute or as easy as that of the ♂.

A difficulty in description arises from the want of a nomenclature of the parts. Descriptive terms are lacking for the peculiar forms assumed by the clasper of the ♂, while for the ♀ I have been unable to find any nomenclature whatever.

For the males, J. S. Baly has proposed a nomenclature, in Trans. Ent. Soc. Lond., 1879, p. 173, but this is not entirely applicable to the present genus, and is, in my opinion, far from the best that can be proposed. He calls the entire male organ the "telum." I propose to use this term for the corneous tube inclosing the true membranous penis and the other soft parts. It differs in structure in *Lachnosterna* in that it varies from a complete tube to a half cylinder, closed or open at the top. I have made no use of the variations of this part, and doubt its ever furnishing available characters. Surmounting this are the clasppers, or, as Baly says, the "apex." These are the organs whose variations furnish the specific characters, and I believe the term clasper, expressive of its use, is better than the term apex, expressive merely of position. What Baly calls the "valve" I have been unable to fix satis-

factorily in this genus, and therefore use neither the term nor any substitute. What I take to be the true penis or intromittent organ, Baly calls the "duct." It is entirely membranous and therefore useless in classification. The variations mentioned by Baly are largely individual, and will vary according as the specimen has or has not copulated.

In the females I have found no guide at all to a nomenclature. The structures, as they appear in *Lachnosterna*, consist of a pair of broad inferior plates, of a generally similar shape and which I do not specifically refer to in this paper, as the other structures render their use unnecessary. They may however in other groups prove of value. Above these are a pair of superior plates, generally smaller and narrower than the inferior, and much more variable. When the organs are most fully developed these plates are excised at their point of superior union, and are surmounted by a pubic process very variable in shape in the species, and this organ is the one which furnishes most of the characters used in this paper. Where this structure is not present the superior plates are much more specialized, and the variations are then specific. In a very few species the corneous characters are reduced to a single pair of imperfectly chitinized plates, and there are then no visible differences to be observed. I have found that the more unsymmetrical and the more developed the character of the male, the stronger will be found the characters of the female. As the male characters become symmetrical the female characters become less prominent, the pubic process first disappearing, until with the least development of the males the corneous characters disappear almost entirely and at all events are useless for specific identification.

I shall not undertake very full verbal descriptions of these parts, but prefer to let my figures answer most of the questions. A reference to these figures will show my reason very clearly, as no words could accurately describe the peculiar turnings and twistings. The mobility of the male claspers is not great in any case, and in some species they are absolutely immobile, being united in front and forming a complete ring. The modification in these species is not very great, and in the females the characters are, of course, correspondingly weak. It is not easy to watch coition in these insects, though specimens *in coitu* are not uncommon in some species. *Tristis* is most usually found *in coitu*, *hirticula* next, in my experience, and the others comparatively rare. *Tristis* is one of those in which the claspers are not mobile, and no observations could be made of their use. *Hirticula* has claspers which are decidedly dissimilar, while the female structures are well marked. I never succeeded in seeing the union of the sexes, though quite a number were taken united. From these specimens I tried to see the method of union, but was not very successful, as the male claspers so completely envelope the female parts that little could be seen of them. I did see, however, that the claspers held more particularly the pubic process, and that the inferior plates are not at all concerned in the

union of the sexes. I tried prying the claspers apart, but they broke rather than yielded; pulling resulted in tearing out the organs of one or the other; and then it struck me that possibly a little twist might loosen them, and it did. I found it easy thereafter to disconnect the corneous portions of the sexes by simply turning the specimens at right angles to each other; this unlocked them at once. The apparent immobility or very slight range of motion might possibly explain the asymmetry by the suggestion that the claspers form a real lock, which by a simple twist engages the corresponding female hasp or process, and holds it fast against all direct strains, yielding at once, however, to the unlocking motion. Consistent with this is the fact that all those species with dissimilar claspers have well-developed female organs, while greater simplicity in the ♂ is accompanied by a reduction and final loss of corneous parts in the ♀. Why this should be so I do not venture to explain.

Further comments and suggestions belong more properly under the notes on the species.

It is easy in fresh specimens to extrude the genitalia in both sexes. Simple pressure of the abdomen will usually force them out at once to full view. In alcoholic specimens a curved forceps inserted in the anal opening will readily grasp the corneous processes and bring them to view without difficulty. In dry specimens the abdomen can be readily removed, the organs taken out, and the abdomen then replaced with a drop of shellac. It is more easy, however, to relax by throwing in water for a couple of hours, when they can be treated as are alcoholic specimens. Much more rapid and in many respects more satisfactory is turning a small jet of steam on the specimen, which will render it fit for examination in about two minutes. I relaxed most of the specimens examined by turning the escape valve of the steam-heater in my room at the Museum into a large jar containing the specimens to be softened. This, by the bye, is our method of softening dried Coleoptera for mounting; unfortunately it is available only in the winter, when the steam-heaters are in use.

Before going on to the annotations I will give the results of the collections made during the season of 1888 by the combined forces of the Washington entomologists, not only to show the quantity of material at command, but also to give an idea of the richness of the fauna of the District and to show what thorough collecting in any one locality will bring to light.

Several points were visited. Our principal collecting ground was the park surrounding the Department of Agriculture. In one corner were many young oaks and hickorys of various species, and here, with a grassy lawn kept free from all undergrowth, was an ideal place. The outfit consisted of an umbrella, a heavy stick, a lantern, and unlimited bottles. One man handled the umbrella and cane; that is, he did the beating of the trees, while the other managed the lantern and bottles, both gath-

ering in the spoils. Usually there were two parties. The species begin to fly just at dusk, and a few could be taken before dark on low trees. As soon as darkness set in, the buzzing became audible everywhere, and hundreds of insects could be felt rather than seen, while the trees began rustling as with life. It was interesting to note the start of the specimens. First a slight whirr of wings in the grass, then a momentary silence followed by another whirr, this again followed by an interval before the specimen finally flew off with a hum. Beating began at dark, when a branch outlined by the faint light of the sky could be seen to be surrounded by the multitude of specimens. Work was steadily continued, the same trees being visited at short intervals until 9.30 to 10 p. m., when the beetles were generally settled for the night and ceased flying. By this time, too, our bottles were generally sufficiently full, and we were ready to quit. We found that young trees were the favorites throughout, and that the crowns and upper branches of large trees suffered most.

In order to try the effect of different surroundings, we made occasional excursions to the Virginia side of the Potomac, just above Washington, and here we took other species in smaller numbers and with infinitely more trouble.

My house is situated on Lanier Heights, about half a mile outside of the city, to the north, and on the crest of a hill overlooking Rock Creek Valley. The ground is bare, and there are no trees except along the road and on my grounds. On the terrace back of my house a few young pear trees proved a source of great attraction, and only persistent collection saved them from complete destruction. In front of my house I have about 50 feet of privet hedge, and into this, on some evenings, I could put my hands at random, sure to get a few specimens. They ate little of this, however, and did no appreciable damage. A Wistaria vine on one side of my front porch was still more attractive, and this they damaged badly. They did not touch my roses, though others reported great damage to them. At the foot of the hill upon which the house stands, and at the entrance of a deep, narrow valley leading to Rock Creek, there are a few large oaks, and here only *L. affinis* was found feeding.

Finally we made three trips to Rock Creek Valley, with poor success; for though there were plenty of the most attractive and convenient trees for the imagos, there is no true sod, and but a sparse covering of vegetation on the clay soil and gravel—no place for larva. The results of our collecting seem to prove that grass is absolutely necessary to produce numerous specimens. The imagos of *L. arcuata* I found perfectly colored and matured in October, 1887, and the date of their first appearance in 1888—April 30—was coincident with the first really warm day of spring.

With this description of localities the references hereafter will be more easily understood.

The captures of an evening were carefully overhauled next morning, every specimen being examined for sex and variations, and many of each lot being examined as to genital structure to discover possible variations in these structures. Especially was I careful to examine all those offering any superficial variations in any direction. As already stated, none were discovered; they were absolutely constant.

I shall first give the collections by dates, and afterward a list of the species, with localities and dates of capture, and relative abundance.

April 30.—A very hot day. Beetles appeared for the first time this season, beginning to fly early and everywhere. Observed them in great numbers on the young maples in front of the house, and found them mostly females. None were preserved, and no notes were made.

Following this unusually hot day, which brought out everything, there came a week of unpleasant weather, during which no collecting was done, and but few specimens were flying. I noted, however, late in the week that the blossoms of my pear trees began to drop, and on examination found that on most of them there were little notches bitten out of the flower stem, preventing of course the setting of the fruit. This damage I traced to *Lachnosterna*, and thereafter waged war against them. I observed that they flew freely early in the evening, and settled down to work when it became dark, flying little afterward; therefore, if I cleared my trees by shaking into an umbrella after it was fully dark, they were safe for the balance of the night. Warm, sultry evenings they were most active, and on one occasion, coming home near midnight, I heard them in my hedges and on the small maples buzzing and occasionally flying.

On this point—flying—it may be interesting to note that Mr. Schwarz and myself noticed that, as in the European Cockchafer, our species, before starting a flight, inflate the abdomen by rapidly expanding and contracting several times, expanding the wings meanwhile, and this is probably what causes the preliminary buzzing noticed in the evening before the steady hum of flight.

May 6.—Detailed memorandum lost. The note says: "The small number of specimens is accounted for by the capacity of the collecting bottle. *Hirticula* came first, before it was quite dark; with it, *micans; fusca* came last. This *fusca* is the form afterward made out as distinct under the term *arcuata*. In future I will use the latter term.

May 7.—Lanier Heights. *L. arcuata*, 144 ♂, 121 ♀; *L. hirticula*, 11 ♂, 32 ♀; *L. tristis*, 1 ♂, 1 ♀ (in cop.); *L. micans*, 1 ♀; *L. affinis*, 3 ♀; *L. inversa*, 1 ♀.

At the pear trees the collection was made without light. *Hirticula*, *micans*, and *tristis* came at about the same time. I believe the *affinis* and *inversa* were also taken early, flying from the oaks at the foot of the hill. Later the specimens taken on privet and wisteria were almost without exception *arcuata*. They would commence to eat the most tender tips first, but never ate much. Some would take little bites out of

the stalks, which turned black next day, and the twig afterward withered. The series of *arcuata* showed in the male a considerable, though gradual, variation in size, the ventral character remaining identical. The depression on the last segment is oval, O-shaped, the upper end encroaching on the penultimate segment, the crest of the ridge distinct and overhanging. Smaller specimens had the character most intensified. Four distinct forms were separable, fairly defined, yet with intermediate forms.

(1) A large, darker, robust, heavily punctured form, with discolored ventricose abdomen, and very firm elytra.

(2) The ordinary smooth form, varying in color, and often fully as dark as the preceding. Elytra softer, abdomen paler, form less ventricose in both sexes.

(3) A robust brown form, considerably smaller than the preceding, but proportionately broader. The punctuation is distinct.

(4) A still smaller, parallel form, which I thought at first might be different. It varies from castaneous to piceous, and the elytral punctuation tends to become rugulose; in one specimen it is so.

May 8.—At Lanier Heights. A chilly night; but few specimens flying. *L. arcuata*, 65 ♂, 19 ♀; *L. hirticula*, 6 ♂, 6 ♀; *L. affinis*, 1 ♀.

There was nothing in *arcuata* not previously noted. Two only of the forms taken yesterday were distinguishable in this lot in both sexes. The small specimens still uniformly have the ventral characters best marked.

May 9.—At Lanier Heights. Somewhat sultry, but a chilly, moist wind. Insects abundant early in the evening; at 9.30 very few were found on the trees and hedges. There was no reserve to take the place of those captured my me. *L. arcuata*, 156 ♂, 68 ♀; *L. hirticula*, 18 ♂, 28 ♀; *L. inversa*, 1 ♂, 1 ♀; *L. affinis*, 1 ♂, 1 ♀.

May 10.—At Lanier Heights. A cloudy, chilly evening. Mr. C. H. Roberts with me. *L. arcuata*, 176 ♂, 190 ♀; *L. hirticula*, 19 ♂, 46 ♀; *L. affinis*, 7 ♂, 2 ♀; *L. micans*, 2 ♀.

May 11.—Lanier Heights. Mr. Roberts and myself took: *L. arcuata*, 30 ♂, 26 ♀; *L. hirticula*, 5 ♂, 3 ♀, *L. micans*, 2 ♂, 2 ♀; *L. inversa*, 1 ♂, 1 ♀; *L. affinis*, 1 ♂.

On this date I received also the first specimen of *L. crenulata*, said to have been very numerous and destructive to Roses, a few miles from Washington.

May 12.—At Lanier Heights with Mr. Roberts. *L. arcuata*, 77 ♂, 106 ♀; *L. ilicis*, 1 ♂; *L. micans*, 1 ♂; *L. inversa*, 2 ♂, 1 ♀; *L. hirticula*, 3 ♂, 7 ♀; *L. affinis*, 3 ♂, 1 ♀.

The evening was dull, close, and yet cold, and the collections were chiefly on pear.

May 13.—At Lanier Heights, with Mr. Roberts. Evening chilly, with quite heavy rains later. Very little flying. *L. arcuata*, 9 ♂, 3 ♀; *L. hirticula*, 2 ♂, 3 ♀; *L. inversa*, 1 ♀.

In the afternoon of this day I picked up the first specimen of *L. fraterna* ♀, on the road.

May 14.—Cold and rainy. No beetles flying and none came to light.

May 15.—The same conditions prevailed.

May 16.—Chilly, yet close. No rain. Mr. Roberts and myself went down into Rock Creek Valley, but neither saw nor heard a specimen. The blackberries are just beginning to bloom but attracted nothing. Returning, we found on the pear trees *L. arcuata*, 1 ♂, 2 ♀.

May 17.—On the Department of Agriculture grounds, the party consisting of Messrs. Schwarz, Pergande, Roberts, and myself. The evening was cool and threatening, but it did not rain.

The result of the combined collections was: *L. arcuata*, 367 ♂, 164 ♀; *L. inversa*, 230 ♂, 107 ♀; *L. hirticula*, 57 ♂, 43 ♀; *L. micans*, 3 ♂; *L. fraterna*, 2 ♂; *L. hornii*, 1 ♀; in all, 974 specimens. Mr. Roberts kindly assisted me in sorting this catch. Oaks and hickorys were beaten, the oaks giving the *fraterna* and *hornii*. The *fraterna* here taken, by the bye, is the form determined as *forsteri* by Dr. Horn, and to this form his paper led me in the determination. After-study convinced me that the specimens taken on the Agricultural grounds were really of a distinct species. As I did not make this discovery until after the collecting season was over, I can not say exactly what specimens are *fraterna* and what the new species as they are referred to in my notes. I shall therefore make no effort to distinguish here, but will call every thing *fraterna* that then seemed to be such.

The time spent was about one and one-half hours, and the capacity of the bottles determined the cessation of the collection.

May 18.—Lanier Heights with Mr. Roberts. The oaks at the foot of the hill were visited and gave: *L. fraterna*, 2 ♂; *L. micans*, 3 ♂. On privet and pear we took: *L. arcuata*, 7 ♂, 7 ♀; *L. hirticula*, 3 ♂.

May 20.—Lanier Heights with Mr. Roberts. The oaks at the foot of the hill were again visited; the night was damp, chilly, and moonlit. *L. arcuata*, 3 ♂, 1 ♀; *L. hirticula*, 13 ♂, 4 ♀; *L. tristis*, 3 ♂; *L. affinis*, 4 ♂, 5 ♀; *L. inversa*, 2 ♂, 2 ♀.

The *affinis* with one exception were from the same tree; the others close by, gave principally *hirticula*; *inversa* scattered; the *tristis* were on the same tree with *affinis*.

The ground was full of *hirticula*, buzzing in every direction. No more were taken by us because they flew to the high branches, which were not easily reached. Nothing was found either on pear or on privet.

May 22.—At the Department of Agriculture, Messrs. Schwarz, Pergande, Alwood, and myself. Night cool and cloudy: oak, hickory, and hazel were beaten and proved almost equally productive. *L. tristis*, 1 ♀; *L. hornii*, 1 ♂; *L. fraterna*, 3 ♂; *L. hirticula*, 64 ♂, 42 ♀; *L. arcuata*, 146 ♂, 194 ♀; *L. inversa*, 137 ♂, 145 ♀; in all, 733 specimens. The principal flight seems over. It is noteworthy that the character

of the fauna remains the same; there is no addition or subtraction of species.

May 26.—At Lanier Heights took about 39 specimens of *arcuata*, and nearly all females. Previous evenings had not been favorable for collecting, and only a few specimens flew to light, and were not noted.

May 27.—At Lanier Heights. Collection was from pear, and quite a number on the succulent weeds of my lower terrace, which I had allowed to run wild. *L. arcuata*, 17 ♂; 51 ♀; *L. inversa*, 1 ♂, 1 ♀; *L. hirticula*, 4 ♂, 4 ♀; *L. tristis*, 1 ♀.

The preponderance of the females at this time is worthy of note. On this date Mr. Ulke found *crenulata* for the first time at the electric lights.

May 28.—At Lanier Heights. Night hot and close, *Photinus pyralis* appearing in numbers. *L. micans*, 1 ♀; *L. affinis*, 1 ♂, 1 ♀; *L. hirticula*, 1 ♀; *L. arcuata*, 25 ♂, 59 ♀.

This same evening Messrs. Schwarz and Pergande collected in the Department grounds, keeping the result of beatings on oak and hickory separate. On oak, *L. hirticula*, 4 ♂, 3 ♀; *L. arcuata*, 27 ♂, 46 ♀; *L. inversa*, 16 ♂, 24 ♀. On hickory, *L. hornii*, 2 ♂, 2 ♀; *L. gibbosa*, 1 ♀; *L. inversa*, 72 ♂, 93 ♀; *L. arcuata*, 74 ♂, 138 ♀; in all, 513 specimens. *L. gibbosa* is for the first time added to the list of species.

May 29.—In order to test whether the same species would be found under different circumstances, we decided upon a trip to the Virginia shore of the Potomac just above Washington, collecting along the crest of the hills there. The result was quite gratifying, showing that a variety of food plants is apparently necessary for a variety of species, and that perhaps the larvæ are not indiscriminate feeders. Messrs. Schwarz, Pergande, Alwood, Heideman, and myself constituted the party. Every tree and shrub was beaten, though we found oak, hickory, and persimmon as most fruitful. The captures were: *L. hirticula*, 24 ♂, 34 ♀; *L. micans*, 1 ♂, 5 ♀; *L. inversa*, 1 ♂, 3 ♀; *L. ilicis*, 2 ♂; *L. crenulata*, 6 ♂, 5 ♀; *L. fraterna*, 3 ♀; *L. gibbosa*, 1 ♂, 1 ♀; *L. tristis*, 9 ♂, 17 ♀; *L. arcuata*, 5 ♂, 6 ♀; *L. dubia*, 1 ♂. This is the greatest number of species taken on any one night. In addition there were a number of *Serica* (2 species), *Chalepus*, *Ligyrus*, and *Macrodactylus*.

Sumach, which on Long Island I had found excellent for *Serica*, yielded nothing. Blackberry blossoms, on which I had taken *crenulata* by the hundreds on Long Island, also proved unattractive here, while persimmon proved quite unexpectedly fruitful of specimens.

June 3.—Rock Creek Valley. Mr. Schwarz and myself. Cool and damp, little insect life stirring. *L. affinis*, 1 ♂, 1 ♀; *L. fraterna*, 1 ♂; *L. inversa*, 3 ♀; *L. arcuata*, 5 ♂, 4 ♀; *L. hirticula*, 1 ♂, 1 ♀.

Of the *affinis* the ♂ was taken on persimmon and the 2 ♀ on the old oak upon which most of the other specimens were found.

June 4.—Virginia. Mr. Schwarz, Mr. Alwood, and myself. *L. inversa*, 1 ♀; *L. arcuata*, 1 ♂, 1 ♀; *L. crenulata*, 2 ♀; *L. fraterna*, 1 ♂, 6 ♀; *L. micans*, 1 ♂, 7 ♀; *L. hirticula*, 17 ♂, 24 ♀. Many of these

were on persimmon, while, as on the previous occasion, neither sumach nor blackberry yielded anything.

On the way to our collecting ground we picked out of a fountain: *L. hornii*, 1 ♀ ; *L. gibbosa*, 1 ♂ .

June 9.—Rock Creek Valley. Mr. Schwarz, Mr. Alwood, and myself.

The results are poor. *L. affinis*, 1 ♂ ; *L. inversa*, 1 ♂ , 5 ♀ ; *L. tristis*, 1 ♀ ; *L. hirticula*, 8 ♂ , 17 ♀ : *L. fraterna*, 2 ♀ ; *L. micans*, 7 ♂ , 6 ♀ ; *L. arcuata*, 6 ♂ , 25 ♀ .

The night was one in every respect favorable, the location so far as trees are concerned could not be better, but the sod is poor, grass thin, and indeed very little true grass at all. This seems to point strongly to the reason why the Department grounds proved such an excellent locality.

Persimmon seems a favorite here. On my pear trees a very few *arcuata* were found. Since our last Virginia trip, the electric light fauna has changed. The species of *Lachnosterna* are now generally replaced by *Chalepus* and *Ligyrus*, while *Diplotaxis* is not rare.

The nights from the 10th to the 13th, inclusive, were cold and windy, and nothing but a few *arcuata* and *hirticula*, and an occasional *inversa*, ventured out.

At this point the notes cease. From this time to the end of the month almost every moment of my time, both day and evening, was taken up in work on the exhibit collection for the Cincinnati Exposition, three months' work being crowded into three weeks. One other trip to the Department grounds was made by Mr. Schwarz and myself, developing nothing new. Into my window at Lanier Heights a few specimens found their way, attracted by the light, but they were not numerous.

On June 30, I left for Cincinnati, returning about the 10th of July. Mr. Schwarz and myself then made another trip to the Department of Agriculture grounds, turning up a few specimens of *gracilis* only. This species was new to me, not having been seen at all before I left.

Mr. Ulke, who continued collecting at the electric lights, reports the first arrival of *ephilida* and *gracilis* on July 17, the former rarely, the latter abundantly. On July 19 the last *fraterna* was taken at light. On August 6 one specimen each of *quercus* and *gracilis* appeared, and on August 8 one specimen of *ephilida*. This closes the record.

Mr. Ulke also took *L. marginalis*, *L. villifrons*, and *L. balia* at light; we found none in beating.

This record gives approximately the local material at hand, all of which was carefully studied in the preparation of this paper. In the form of a list the following were taken in and around the city of Washington during the season of 1888, as set out above:

Lachnosterna ephilida Say.
gracilis Burm.
Lachnosterna gibbosa Burm.
affinis Lec.

Lachnosterna inversa Horn.
micans Knoch.
arcuata Smith.
dubia Smith.
marginalis Lec. (fide Ulke).
fraterna Harris.
nova Smith.
hirsuta Knoch (fide Ulke)

Lachnosterna villifrons Lec. (fide Ulke).
balia Say (fide Ulke).
hirticula Knoch.
ilicis Knoch.
hornii Smith.
crenulata Fröhl.
quercus Knoch (fide Ulke).
tristis Fabr.

In all, twenty species, four of them heretofore undescribed or not recognized as distinct. There is no reason why other localities should not do as well, and I am firmly convinced that there are still many new species to be discovered.

To this list of species occurring in the District of Columbia must be added the following, represented in the local collections:

Lachnosterna congrua Lec. (Coll. Ulke); grandis Smith (Coll. div.); luctuosa Horn (Coll. Schwarz); profunda Blanch (Coll. Ulke); parvidens Lec. (Coll. Ulke).

This gives a total of twenty-five species, a rather disproportionate representation of the total number for so small a territory in so widely distributed a genus as *Lachnosterna*, and it indicates a considerable addition to the number of species when careful collections shall have been made. These collections Dr. Horn's paper have made possible, and it well illustrates the peculiar and intuitive perception of relationships so marked in the doctor's work that nearly all of his groups turn out to be perfectly natural after the study of the genital organs.

To the kindness of Mr. Westcott, of Chicago, I owe a chance to examine some of the catch recorded in an 1888 number of Entomologica Americana, and among them I found the following: *Lachnosterna gibbosa*, 230 ♂, 2 ♀; *Lachnosterna dubia*, 10 ♂; *Lachnosterna fusca*, 53 ♂, 2 ♀; *Lachnosterna grandis*, 1 ♂.

The preponderance of the males is easily explained by the fact that these collections were all made at light, and the males are always very much more numerously attracted than the females.

To the kindness of Mr. Ulke I owe a large lot of specimens collected at the electric light at Cleveland, Ohio, and these proved all of one species—the true *fusca*. There were 150 males and 74 females.

NOTES ON THE SPECIES, PRINCIPALLY IN THE MUSEUM COLLECTION.

1. L. lanceolata Say.

We have numerous specimens, ♂ and ♀: Texas (Coll. Riley and Smith), Kansas (Coll. Riley and Smith), New Mexico (Coll. Smith), Colorado, July (Riley), Missouri (Riley).

Our Kansas specimens are decidedly paler than the specimens from the other localities, and do not seem to be immature. Mr. Ulke's collection has specimens from Nebraska and Dakota.

The genitalia of both sexes are shown at Pl. XLVIII, fig. 1. They are extremely simple, and resemble closely the forms found at the extreme

end of the series. In the male the claspers are symmetrical, and are completely united, forming an entire circle. In the female, there is only a single pair of corneous plates.*

2. L. cribrosa Lec., 4 ♂, 3 ♂.

All from Belfrage, Tex. (Coll. Riley.) Mr. Ulke has it from Arizona.

In this species the genitalia are somewhat more distinctive in both sexes. In the male the claspers are still united along the front, but they are more characteristic, and in the female the two pair of plates are distinct.

In addition to the differences noted by Dr. Horn, the females in our collection are rather stouter, more ventricose than the males.

3. L. æqualis Lec.

Not in our collection: Dr. Horn says it was a unique from El Paso, Tex. It is not in his collection, and I have been unable to obtain any specimen for study.

4. L. farcta Lec.

Several specimens of both sexes, all from Texas, and mostly collected by Belfrage. (Coll. Riley and Smith.) Two of the specimens are dated April 27.

The genitalia of both sexes are figured, Pl. XLVIII, fig. 4. They differ in the male, in that the claspers are well separated in front though not at all mobile, being completely united posteriorly. The sides are perfectly symmetrical. In the female the upper plates are united, and form a representative of the public process.

5. L. torta Lec.

There are 8 ♂ and 2 ♀ in the collection, all of them from Texas. (Coll. Riley and J. B. Smith.) One specimen is marked Dallas, Tex.

Mr. Ulke's collection contains a specimen from New Mexico; Mr. Schwarz has the species from Columbus, Tex., July 9. It seems a late flyer.

The genitalia in both sexes are well developed. In the ♂ they are symmetrical, united by a single point in front. The ♀ has the superior plates united, forming a pseudo-pubic process.

No variations not recorded by Dr. Horn were observed.

6. L. hamata Horn.

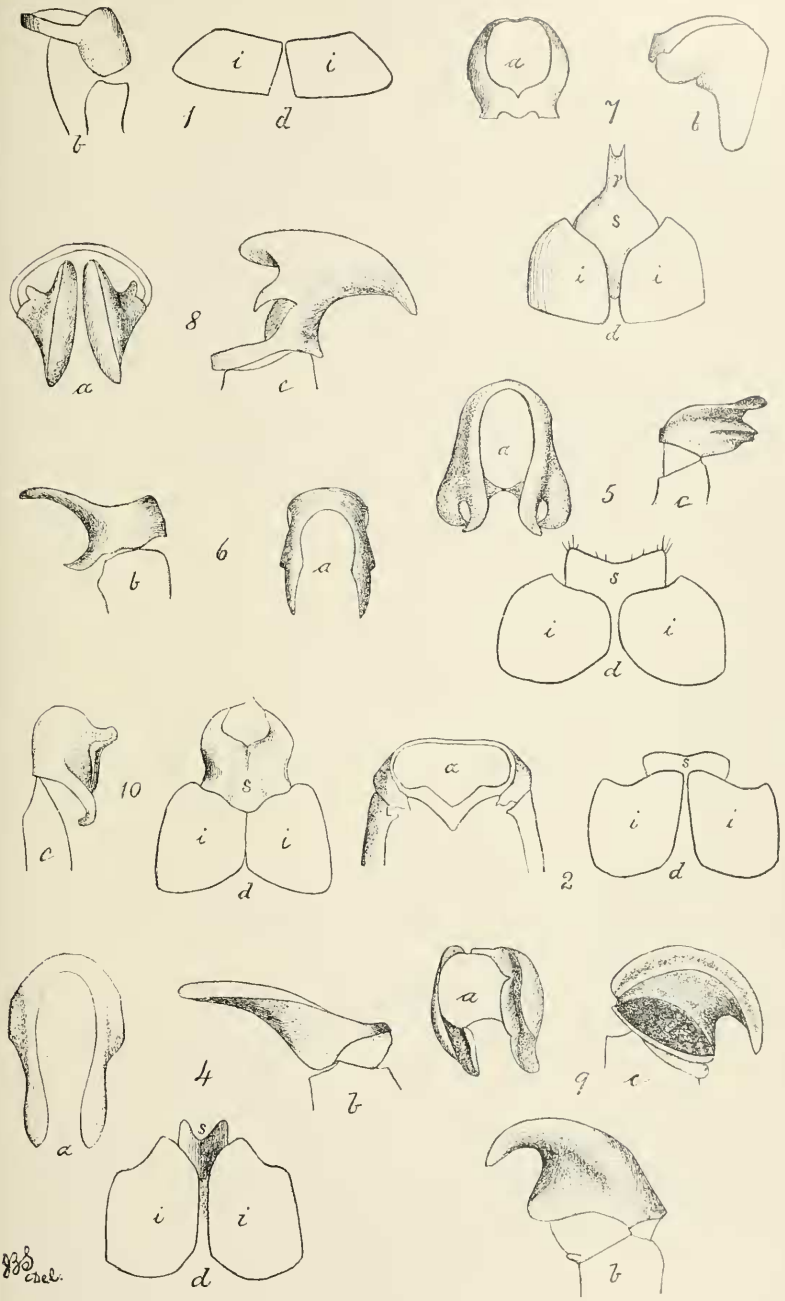
Not in our collection. The type is a unique ♂ from Texas, in the collection of Dr. Horn.

The genitalia, which Dr. Horn kindly allowed me to extract from the ♂, are symmetrical, somewhat more simple than in *torta*, but the claspers perfectly free in front, though so united as to be immobile.

7. L. latifrons Lec.

A few specimens, mostly ♂, are in our collection, two of them donated by Mr. Schwarz, the others retained from lots received for determina-

*As this paper is intended to be rather supplementary to Dr. Horn's Revision, none of the matters referred to by the Doctor will be touched upon here except where necessary.



SEXUAL CHARACTERS OF LACHNOSTERNA.

1. *L. lanceolata*, ♂ and ♀.
2. *L. cribrosa*, ♂ and ♀.
4. *L. farcta*, ♂ and ♀.
5. *L. torta*, ♂ and ♀.
6. *L. hamata*, ♂.
7. *L. latifrons*, ♂ and ♀.
8. *L. generosa*, ♂.
9. *L. pretermissa*, ♂.
10. *L. prununcolina*, ♂ and ♀.

(Explanation of plate on page 524.)

tion. There is quite a difference in the coloration of the specimens seen, though none in other directions.

All the specimens are from Florida. Mr. Schwarz has the following dates: Biscayne, May 19, 21; Enterprise, May 24; Lake Harney, May 4.

The genitalia of the ♂ are distinctly united in front, and more simple than in the immediately preceding species. The ♀, on the contrary, is very characteristic, and much more strongly developed as to genitalia than the simple characters of the ♂ would seem to indicate. The inferior plates are well developed, and the superior plates and pubic process are fused into one piece. It is really a modification of the superior plates, which are united on the median line.

8. L. generosa Horn.

Not in our collection. Dr. Horn had only a single ♂ specimen from Texas, and from this he allowed me to study the genitalia. These are symmetrical, the claspers not united in front, and somewhat unique in shape. The species seems rare, and so far I have not seen any other specimen.

9. L. praetermissa Horn.

Not in our collection. The species (♂ only) was collected by Morrison in Louisiana, but none were in the collection obtained by the Museum. From a specimen loaned by Dr. Horn the genitalia were studied, and are of decided interest as the first showing marked asymmetry of the claspers and partial mobility. Three figures are given showing the claspers from above and from each side. Quite a different place for this species would seem to be indicated by this structure.

10. L. prununculina Burm.

Five specimens are in the collection: 1 ♂ (Florida, coll. J. B. Smith); 4 ♀ (Georgia, coll. Riley and J. B. Smith). The male is reddish brown, shining; the females are all blackish, opaque, with slight iridescence.

Mr. Schwarz has it from Tampa, Fla., April 28, and Crescent City, Fla., June 8—an unusually long period for the species. Mr. Ulke's collection contains specimens from Virginia, the most northern point thus far recorded.

The genitalia of both sexes are distinctive. In the male they are symmetrical, the claspers immobile. They are peculiar by the vertical development. In the female the superior plates are very strongly modified, forming a very obvious lead to some of the strongly developed forms of the *rugosa* group.

11. L. glaberrima Blanch.

Males and females in the collection. Cedar Keys, Fla., June 6 (coll. C. V. R.), 2 ♂; Florida (coll. J. B. S.), 1 ♂; Kentucky, 1 ♀ (coll. J. B. S.); Delaware (coll. J. B. S.), 1 ♂; New Jersey (coll. C. V. R.), 1 ♀;

Coney Island, N. Y. (coll. J. B. S.), 1 ♂, 1 ♀. The Coney Island specimens may well be from New Jersey, having been found on the beach. Mr. Schwarz has the species from Capron, Fla., April 14, 22; Enterprise, May 21; Cedar Keys, June 5, 6. Mr. Ulke has specimens from Florida, Maryland, New York, Illinois. Dr. Horn gives "Pennsylvania to Florida" as the range of the species.

In genital structure this species approaches the preceding. In the male the claspers are symmetrical, free, and developed in the same vertical direction noticeable in *prunuculina*. The female characters are much less strongly developed, though in the same line as in the previous species. The figures are left to explain the differences.

12. L. ephilida Say.

Males and females are in the collection. Louisiana (coll. J. B. S.), 4 ♂; Kansas (coll. C. V. R., from Morrison), 5 ♂; Pennsylvania (coll. C. V. R.), 1 ♂, 2 ♀; District of Columbia (Museum coll.), many specimens of each sex. For dates of the local collections see the introductory remarks. In Mr. Schwarz's collection is a specimen marked July 26; Mr. Ulke took it in August, and the species is probably the last to disappear, as it is one of the latest in making its appearance.

The specimens from Louisiana are decidedly larger than the others, and very uniform in general appearance.

The genitalia of both sexes are peculiar. Those of the male are unusually large, symmetrical, free in front. In the female the superior plates are lost, or merged into a long, stout, conic process—altogether a peculiar structure. The species may not be widely distributed in Texas, since the Belfrage collection contained no specimens from that State.

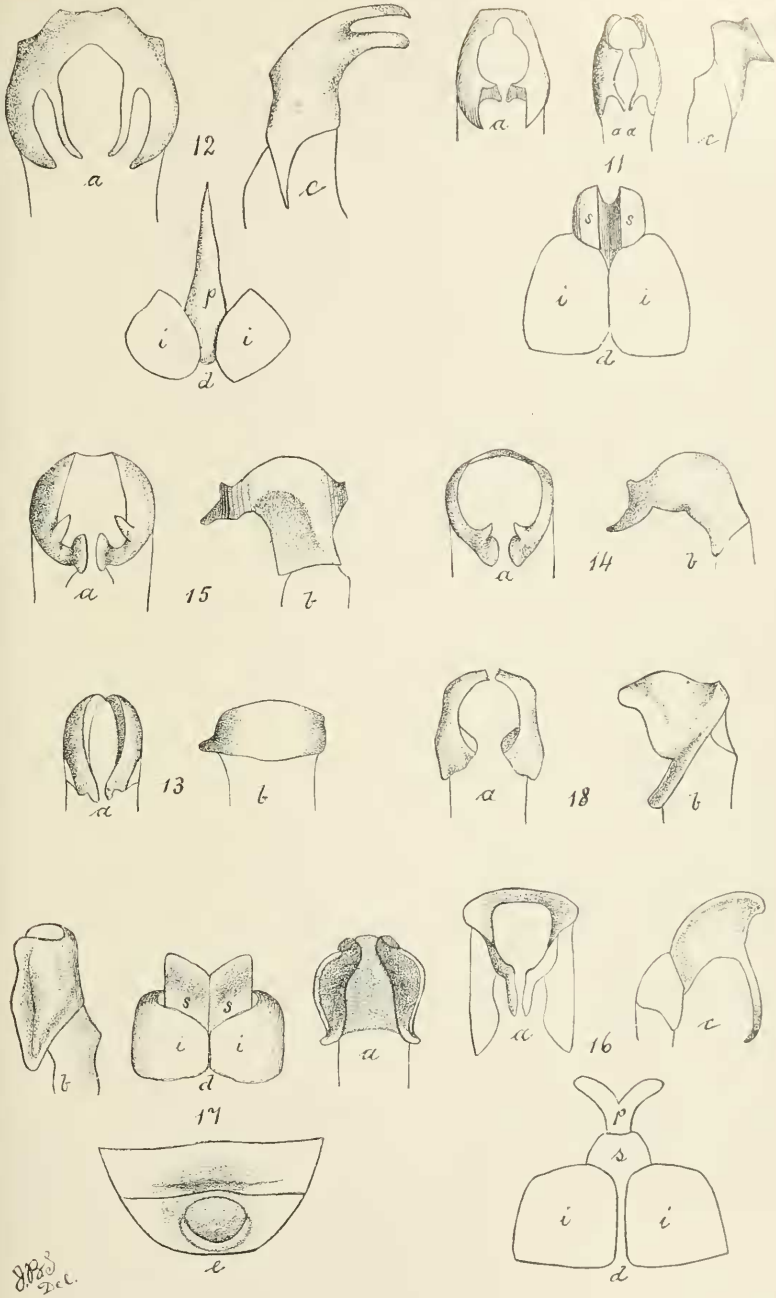
13. L. longitarsus Say.

Two specimens in our collection, both ♂, retained from material sent for name. The specimens are not good, and offer nothing peculiar. The genitalia are simple, symmetrical, and free anteriorly. No ♀ could be obtained for dissections. No localities not covered by Dr. Horn's statements as to distribution have been noted by me.

14. L. clemens Horn.

One ♂ (coll. C. V. R.) from New Jersey is in our collection, from the Belfrage material. Dr. Horn gives Florida and Texas as localities. It is barely possible that the specimen from the Belfrage material was really collected in Texas, but I doubt it. The specimen is not mounted on a Belfrage pin, and has not the almost universal date label of that collection. It would give the species a wide distribution, however, if it should be so, it becomes strange that no specimens from intervening localities have been found.

The genitalia of the ♂ are symmetrical, free anteriorly. The ♀ has not been obtainable by me. The single specimen in the Museum collection was named by Dr. Horn.



SEXUAL CHARACTERS OF LACHNOSTERNA.

11. *L. glaberrima*, ♂ and ♀.
12. *L. ephilida*, ♂ and ♀.
13. *L. longitarsus*, ♂.
14. *L. clemens*, ♂.
15. *L. dispar*, ♂.
16. *L. gracilis*, ♂ and ♀.
17. *L. gibbosa*, ♂ and ♀.
18. *L. hirtiventris*, ♂.

(Explanation of plate on page 524.)

15. L. dispar Burm.

Three ♂ specimens, all from Florida (coll. C. V. R.). Mr. Schwarz has it from Enterprise, Fla., May 7–20, June 9; Lake Harney, Fla., May 4.

In genital structure this species most remarkably resembles the preceding in general type, differing only somewhat in details. The species seems not at all common.

16. L. gracilis Burm.

Many specimens, ♂ and ♀. New York (coll. C. V. R. and J. B. S.), 4 ♂, 1 ♀; New Jersey (coll. C. V. R.), 1 ♂; Pennsylvania (coll. J. B. S.), 1 ♀; North Carolina (coll. C. V. R.), 1 ♀; Louisiana (coll. C. V. R.), 1 ♂ (the North Carolina and Louisiana specimens collected by Morrison). District of Columbia, many specimens, collected for the Museum; for dates, etc., see introductory remarks.

Mr. Schwarz collected it also at Detroit, Mich. This species becomes common rather late in the season and is easily recognized, offering little or no variation except in size.

The genital structure in both sexes is distinctive. The claspers of the ♂ are symmetrical, free anteriorly, with an unusually long curved process. In the ♀, the true pubic process becomes well marked for the first time, the superior plates united, forming the base upon which it rests.

17. L. gibbosa Burm.

Numerous specimens of both sexes. New York (coll. J. B. S.), 5 ♂, 8 ♀; Pennsylvania (coll. J. B. S.), 3 ♂; northern Illinois (coll. C. V. R.), 4 ♂; Detroit, Mich. (coll. C. V. R.), 1 ♂; Minnesota (coll. J. B. S.), 1 ♂, 3 ♀; Nebraska (coll. J. B. S.), 4 ♂; Douglass County, Kans., 9,000 feet (coll. C. V. R.), 1 ♂; Texas (coll. C. V. R.), 1 ♂, 1 ♀; Virginia, June 12 (coll. C. V. R.), 1 ♀; District of Columbia, many specimens, collected for the Museum.

Only the slight color variations indicated by Dr. Horn appear in this series, and there seems to be no racial or geographical modification whatever.

The genitalia of the ♂ approach the type of *glaberrima* and *prununcu-lina*, by the vertical direction of the claspers. In the ♀ the superior plates are more normal, and are divided, still however serving as pubic process. The ventral characters of the ♂ are also figured, a well-marked specimen having been chosen.

18. L. hirtiventris Horn.

A single ♂ specimen from Dallas, Tex. (coll. J. B. S.). This seems rather a rare species in collections. The genitalia of the ♂ are distinctive, symmetrical, free anteriorly, and better described by the figure than is possible by words.

Sept. 3, 1889.

19. L. congrua Lec.

The collection contains 18 ♂, 6 ♀. Texas (coll. C. V. R. and J. B. S.), 9 ♂, 6 ♀; Louisiana (coll. J. B. S.), 6 ♂; Missouri (coll. C. V. R.), 3 ♂.

Dr. Horn had no ♀ before him when he wrote. That sex offers nothing at all peculiar, and differs from the ♂ only in the lack of ventral characters, and in the shorter antennal club. In the series before me there is a very marked tendency towards a darkening of the thoracic disk, accompanied by a corresponding paling of the margin. The Texan specimens are, as a whole, much paler in color and considerably smaller (15mm to 19mm). The difference is scarcely racial, however, because one of the Texan specimens is fully as large, and even darker than the most fully developed of the Louisiana forms.

The genitalia in both sexes are distinctive. In the ♂ the claspers are symmetrical, free anteriorly, and tending to a vertical direction. In the ♀ the tendency is again to the modification of the superior plates into the pubic process.

20. L. postrema Horn.

Not in our collection; described from a single ♂ specimen in Dr. Horn's collection, which he kindly allowed me to use.

The genitalia are distinctive, and are decidedly in the line of the *fusca* type. The claspers are decidedly unsymmetrical, and as suggested in the *fusca* group of characters. I have not been able to procure a ♀.

21. L. affinis Lec.

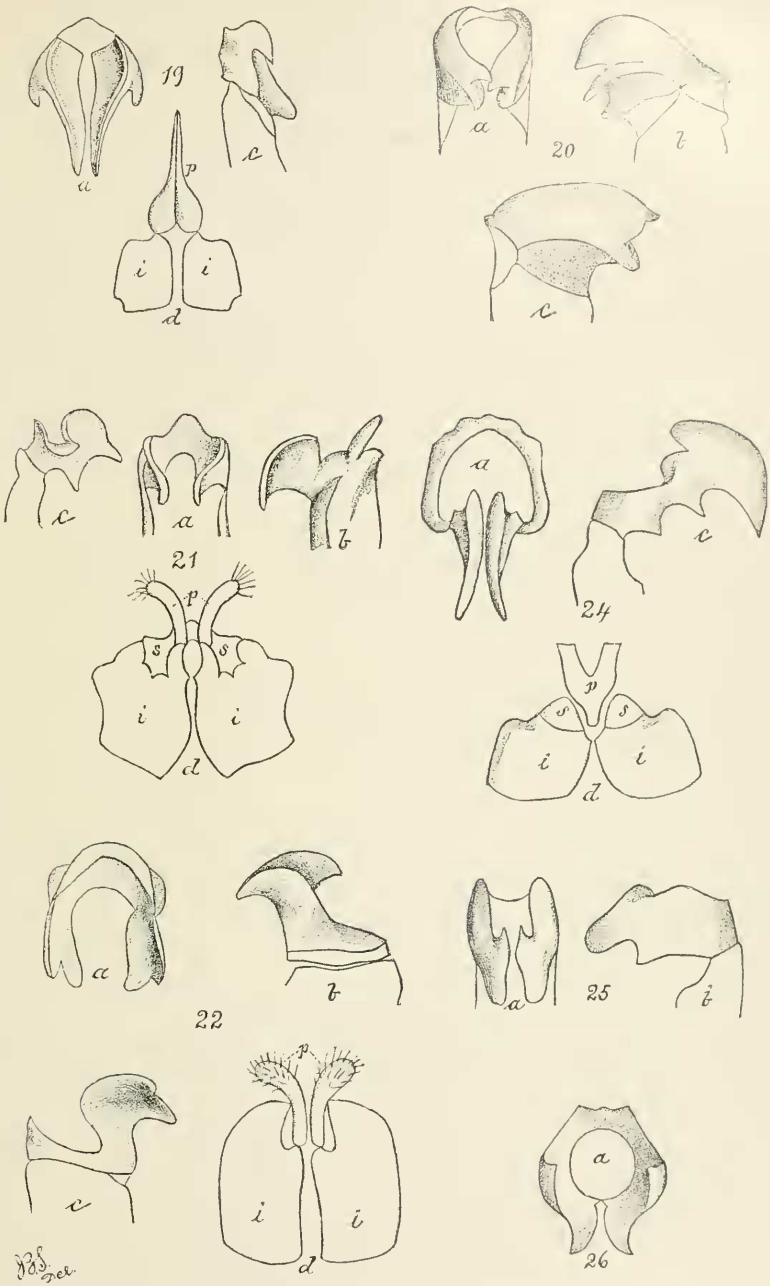
Many specimens, ♂ and ♀, most of them collected for the Museum in the District; 1 ♀, Kansas. Dr. Horn gives as localities Kansas, Colorado, Indian Territory, and Texas. Mr. Ulke has it also from Tennessee, and its occurrence in the District indicates a very wide distribution. The species is a very well marked one, and shows no apparent variation.

The ♂ genitalia are distinctly unsymmetrical, free in front, but immobile, being completely united behind. The ♀ characters are equally strong. The inferior plates distinctly notched and toothed to accommodate the superior plates, which are very much reduced in size, and act as a support to the double pubic process, which rests on spurs from the inferior plates.

It is likely that the species is local; it has proved so at least in the District of Columbia, as is noted in the introduction, to which reference is also made for dates, etc.

22. L. prunina Lec.

Numerous specimens, ♂ and ♀; 1 ♂, Texas (coll. C. V. R.); all the others from Constantine, Mich., collected by Mr. Tyler Townsend. Mr. Townsend informs me that he took all these on raspberry, early in the evening, and that they were very abundant. It seems to be local



SEXUAL CHARACTERS OF LACHNOSTERNA.

19. *L. congrua*, ♂ and ♀.
20. *L. postrema*, ♂.
21. *L. affinis*, ♂ and ♀.
22. *L. prunina*, ♂ and ♀.
24. *L. crassisima*, ♂ and ♀.
25. *L. subpruinosa*, ♂.
26. *L. errans*, ♂.

(Explanation of plate on page 524.)

and not easily taken, judging from the small number of specimens in collections. There is absolutely no variation in the large series before me, save a slight difference in the intensity of the brown.

The genitalia are unsymmetrical in the ♂, the claspers very dissimilar. In the ♀ the superior claspers have become entirely modified into supports for the double pubic process, which is very like that of *affinis* in type, though very different in detail.

23. L. calceata Lec.

We have two ♀ specimens, "Gainesville, Tex., from the stomach of a chuck-will's-widow," May 12. The specimens are of course somewhat damaged, but quite recognizable.

Mr. Schwarz kindly let me have a ♂ specimen for dissection, but by some mishap the preparation was lost, and I can not find that I made even a sketch of it. The species seems rare.

24. L. crasissima Blanch.

We have 15 ♂ and 9 ♀. Texas (coll. C. V. R., J. B. S.), 9 ♂, 3 ♀ Arkansas (coll. J. B. S.), 2 ♂, 2 ♀; Kansas (coll. C. V. R., J. B. S.), 1 ♂, 2 ♀; Nebraska (J. B. S.), 1 ♂; Illinois (coll. J. B. S.), 1 ♀; New York (coll. J. B. S.), 1 ♀.

Dr. Horn gives from Kansas to Texas as localities. I am positive my New York specimen is correct, as it has my local label, and I am also very certain of my Illinois specimen. The species has therefore rather a wide distribution.

The genitalia are distinctive and differ quite considerably from the immediately preceding forms. They are in the ♂ symmetrical, and of a type quite similar to that of *generosa* in the early part of the series. The ♀, on the contrary, has both plates definitely developed, and the pubic process is characteristic, bifid but not double and somewhat flattened.

There is quite a distinct variation in the punctuation of the clypeus. In some specimens it is sparse, the punctures well separated, the intervals smooth, in others the punctures are fully as densely set as in specimens of *fraterna*.

As a rule the ♂ is smaller and paler. One of the ♀ from Arkansas measures .88 inches, larger than any specimen before Dr. Horn (.82 inches).

Otherwise the specimens are very constant and with very little variation in other respects.

25. L. subpruinosa Casey.

Three ♂ are in the collection (coll. J. B. S.) from Pennsylvania.

Dr. Horn says, "Taken near Jacksonville, Fla., by the late Edward Tatnall." The specimens now in the Museum collection were given me by Mr. H. W. Wenzel, and were collected by him in the vicinity of Philadelphia. Mr. Casey described the species from examples taken on Long Island or near it.

No variation appears in our specimens.

The genitalia are very like those of the *micans* type, and in the ♂ are symmetrical. No ♀ specimen has been at hand for study.

26. L. errans Lec.

There is one ♂ specimen from California in the Museum collection received from Mr. Ulke.

The ♂ characters of the species are simple. The claspers are symmetrical and contiguous, if not united in front. They are quite distinctive.

27. L. inversa Horn.

Numerous specimens— ♂ and ♀. Virginia (coll. J. B. S.), ♂, ♀; Illinois (coll. C. V. R., J. B. S.), 5 ♀; Tennessee (coll. C. V. R.), on Apple, May 24. For specimens from District of Columbia collected for the Museum, see dates, etc., in the introduction.

This species was one of the most common at Washington in 1888, and is easily recognizable. In the ♂ the ventral character is obvious; in the ♀ the species closely approaches *fusca—sensu lata*—and is distinguished from *arcuata* by the non-emarginate terminal ventral segment, and from *fusca*—strictly speaking—by the much more feebly spinose posterior tibia, there being no distinct rings of spines.

The genitalia are distinctive in both sexes. The claspers of the ♂ are decidedly dissimilar, and very strongly marked. The ♀ has the pubic process very characteristically developed, and the superior plates distinct. The figure must be referred to, to appreciate the structures. Dr. Horn did not have *inversa* from the District of Columbia, and I have not seen it from northern collections.

28. L. bipartita Horn.

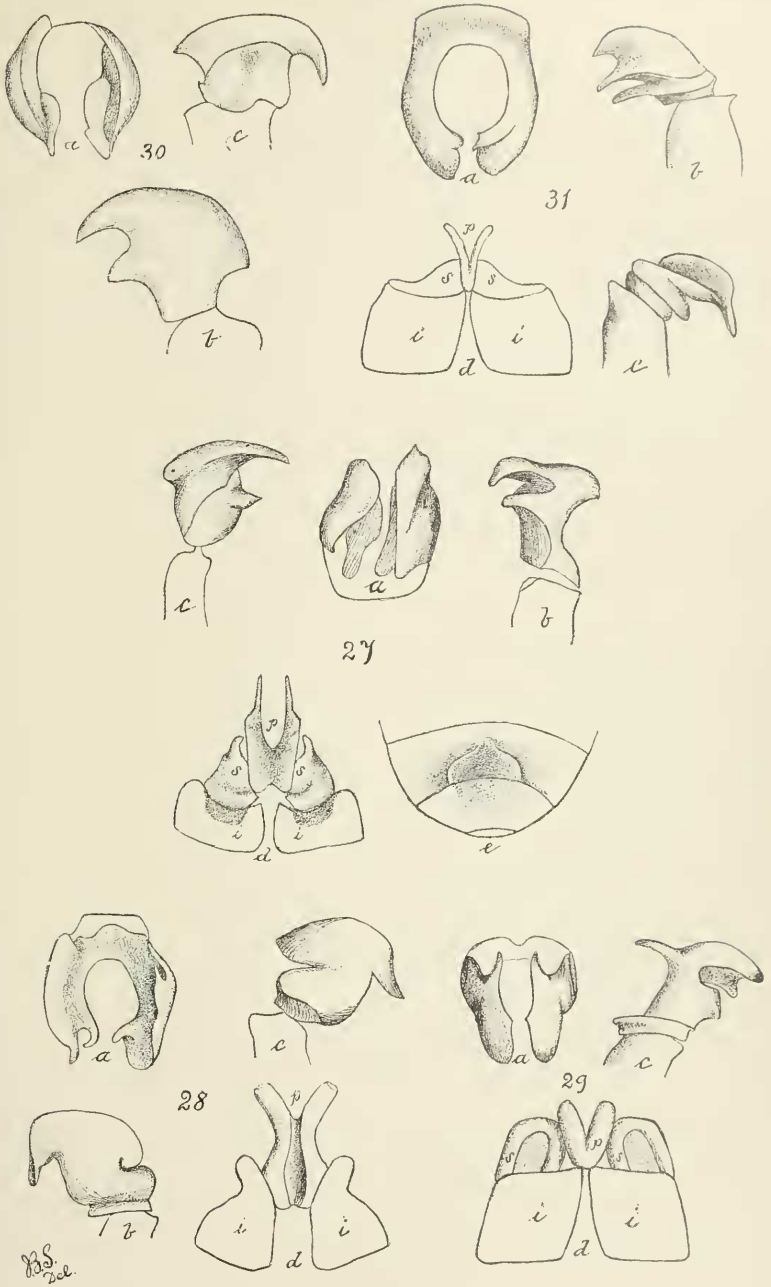
There are 12 ♂, 4 ♀ in the Museum collection. Louisiana, collected by Morrison, 11 ♂, 1 ♀; Tennessee (coll. C V. R.), 1 ♀; Kirkwood, Mo., April 16 (coll. C. V. R.), 1 ♂, 2 ♀. This considerably extends the northward and eastward range of the species as given by Dr. Horn. The specimens are very uniform in appearance.

The genitalia of the specimens examined are distinctive and peculiar by the twisted processes on the inner side of the clasper, which are more characteristic of a later division. In the ♀, also the pubic process is developed much more in the line of the *rugosa* group than of its immediate allies.

Some of the Kansas specimens examined from other collections indicate a new species with essentially the characters of the present, particularly as to the ventral segments of the ♂. It will require careful study of series from all localities to make certain of this. In Kansas, I think there are still many new species to be discovered.

29. L. micans Knoch.

There are numerous specimens of both sexes in the collection. Louisiana (coll. J. B. S. and Morrison), 26 ♂, 1 ♀; Tampa, Fla., March 30 (coll.



SEXUAL CHARACTERS OF LACHNOSTERNA.

27. *L. inversa*, ♂ and ♀.
28. *L. bipartita*, ♂ and ♀.
29. *L. micans*, ♂ and ♀.
30. *L. definita*, ♂.
31. *L. vehemens*, ♂ and ♀.

(Explanation of plate on page 524.)

C. V. R.), 2 ♂, 2 ♀; Missouri, May (coll. C. V. R.), 1 ♂, 1 ♀; New Jersey, New York, Pennsylvania (coll. J. B. S.), 4 ♂, 1 ♀; District of Columbia, large series collected for the Museum.

Florida is not given by Dr. Horn as a locality for this species. The species superficially is a very compact one; but on looking over a large series quite a decided variation of the sexual characters appears. The punctuation of the venter varies quite considerably, and the gibbous ridge of the penultimate segment of the ♂ may be very feeble, or quite prominent; may be close to the hind margin, or from near the front margin and strongly overhanging. The depression on the terminal segment is also variable in depth and extent; occasionally it forms a regular ∩, the closed upper part extending to the middle of the penultimate segment. The ♀ is equally variable; sometimes there is no trace of a depression in the last segment; in other specimens there will be a deep, semicircular depression with very well defined margins, which does not, however, extend to the penultimate segment.

The genitalia of both sexes are distinctive. In the ♂ the claspers are symmetrical and characteristic. In the ♀ the superior plates are peculiarly modified and sculptured, while the small, somewhat heart-shaped pubic process sets in between them.

30. **L. definita** Smith = *diffinis*‡ Horn.

Not in the Museum collection. Dr. Horn says that after examination of Blanchard's type, he finds that he had mistaken the species. Blanchard's *diffinis* is the *comans* of Burmeister, and has priority, while *diffinis* Horn thus becomes nameless. Dr. Horn kindly allowed me to study a ♂ specimen, from which the figures are made. The claspers are dissimilar, as usual, and are quite characteristic, resembling nothing in the near neighborhood very closely.

31. **L. vehemens** Horn.

There is a ♂ and ♀ from Kansas in the Museum collection. The angulation of the posterior femur of the ♂ is a strong character, as is also the peculiar curve of the tibial spur. In ventral characters it very closely approaches the species which I have named *dubia*. The ♀ is more difficult to distinguish from some of the *fusca* forms, but if the transverse impression of the penultimate segment is constant it may serve as an aid. Some specimens of the *fusca* series, however, also show this character, though not so well marked.

The genitalia of both sexes have been examined and also emphasize the affinity of the species. The claspers of the ♂ are dissimilar—less so when viewed from above, and quite characteristic. The ♀ approaches more nearly to the *grandis* type, but the pubic process is much reduced, cleft nearly to the base, while the superior plates are small.

L. FUSCA auct.

It is in this group that the greatest apparent difficulty in the identification of species is encountered. The forms of the typical species are

so variable and yet so strangely similar that after arranging a series to show all the differences in habitus, color, and other details in the strongest light, another series can be built up of precisely the same specimens to show that there is only one form.

The latter conclusion was the one arrived at by Dr. Horn in his study of *fusca*, and he pointed out both the differences that had been considered specific and racial, and the reasons for still considering them forms of the same species. Dr. Horn also pointed out some of the differences in the ventral characters, but considered them within the limits of variability, if even of varietal importance. The misleading character of the aggregation consists in the fact that all the species into which I have divided it vary in precisely the same manner, so that it is easy to obtain a series of specimens almost identical in all characters save those of the ventral segments of the male, and which yet represent at least six different species. Still Dr. Horn left the question somewhat unsettled, and open to future consideration. In the course of our collecting we first noticed the remarkable constancy of the ventral characters of the males of the species, or rather form of *fusca* taken by us, and from this began to consider that it might refer to a distinct species. When finally my attention was directed to the genitalia the suspicion became a certainty, and the true solution of the *fusca* problem became evident. The males, it was found, were thus easily to be separated; the females were in a different case; here there were no anal or ventral characters, and little or nothing in the way of superficial differences. An examination of the primary sexual characters showed, however, that the correlation found in the other species existed here as well, and that the species were well marked in both sexes.

In No. 6 of Insect Life I showed some of these differences, and gave figures of the characters relied upon. Since that time three other species, each coming under the definition of *fusca*, have developed. Of these, one was rather a surprise to me, coming from a region supposed to be well represented in local collections, viz, Snake Hill, New Jersey, while the others represented forms not seen by Dr. Horn and which would have been most probably recognized as distinct by him. The table of species allied to *fusca* as given in Insect Life must therefore be modified, and as the group *fusca* in the restricted sense becomes so much changed, a new table of the species is given.

I wish again to emphasize the fact already mentioned in Insect Life, that I have made no effort to identify the species here separated with the types described by previous authors. I simply had neither the opportunity nor the knowledge of types to enable me to do it. If, at some future time, older names will be identified with my species, I am content to drop my terms, believing that in defining the species I will have disarmed blame for the needless names, if they be such.

The following table includes all those species which agree in the char-

acters which would lead to *fusca* in Dr. Horn's table of species 24-32, on page 238 of his Revision:

Clypeus distinctly emarginate, the angles rounded.
- Ventral ridge of male small, well defined, strongly arcuate and overhanging, the ends at the extreme margin of the penultimate segment, and somewhat overhanging the penultimate segment ..... *arcuata*
- Ventral ridge of male small, well defined, not overhanging, the ends, and indeed the entire ridge, near the middle of the segment ..... *insperata*
- Ventral ridge of male longer, decidedly arcuate, but not so much as before, overhanging posteriorly for its full length, the ends at some distance from the posterior margin of the penultimate segment ..... *dubia*
- Ventral ridge of male still longer, slightly curved, the ends overhanging posteriorly; centrally the ridge is declivous, but not overhanging behind ..... *fusca*
- Ventral ridge of male elevated, nearly straight, not overhanging, scarcely declivous at ends; at center the posterior declivity nearly as gentle as the anterior ..... *grandis*
- Ventral ridge of male not elevated, rigidly straight, and behind it an abrupt depression of the segment ..... *ulkei*

Clypeus feebly emarginate, nearly quadrate, the angles not rounded ..... *quadrata*

By this table the males may be distinguished without much trouble. The females are not so easily separated, yet may be in most cases associated with the males.

32. L. arcuata Smith.

This species, as a whole, averages rather smaller than either of the others. From *dubia* it does not, in the female, differ at all in superficial characters, every effort to discover any feature whereby specimens of this sex might be distinguished from each other having failed. As the genital structure is so distinct, this is somewhat surprising, and possibly the true character has been still overlooked.

The primary characters of the female are much as in *dubia*, and yet obviously different. The pubic process while divided at tip, much as in *dubia*, is only about one-half as long and does not divide the upper plates as in that species. It resembles the upper part of the *dubia* structure set upon the superior plates; these latter are large and nearly quadrate, in marked contrast with the narrow linear structures of *dubia*. The inferior plates differ as markedly, as can be readily seen by a comparison of the figures.

The males also in habitus do not differ from the allied species, except in ventral characters, but these are obvious and easily recognized. The ridge in this species is very much curved, very much overhanging, the ends reaching the apical margin of the segment, while the arch, combined with the depression of the last segment, forms a perfect oval.

In this species the space included by the arch of the ridge is smooth.

The species seems rather more southern than some of the others. It is practically the only form taken at Washington, many thousands being taken, while only one specimen of the other forms was discovered. Other localities are New York, New Jersey, central Missouri, Iowa,

Georgia. The specimens from New York and New Jersey are from my own collection, and form the small minority of the specimens taken. The specimens from central Missouri are from Professor Riley's collection, and the figures in the Missouri Reports, so extensively copied, probably represent this species.

33. L. insperata Smith.

Agrees very completely with Dr. Horn's description of *fusca*, and offering superficially no obvious differences. The ventral characters of the male resemble those of *dubia* and *arcuata*, the ridge being strongly arched and small, but situated back from the posterior margin of the segment, and not overhanging the last ventral. In the female, I have found no distinctive characters. Six specimens, taken under stones early in spring by Mr. M. L. Linell, at Snake Hill, New Jersey, are before me—four of them males, two of them females. The specimens are dark in color, and large and stout, resembling most nearly the larger form of *fusca*, which occurs with it. The male character is recognizable, and I separated out the specimens from a lot of *fusca* at sight. The genitalia of both sexes bear out the intermediate position assigned by the ventral characters.

The claspers of the male are symmetrical—an unusual character—yet in structure combining the features of both *arcuata* and *dubia*. The female is equally characteristic—more nearly allied to *dubia* perhaps both in the form of the superior plates and the pubic process. The plates are larger than in *dubia*, but not nearly so well developed as in *arcuata*. Other differences will appear at a glance by a comparison of the figures.

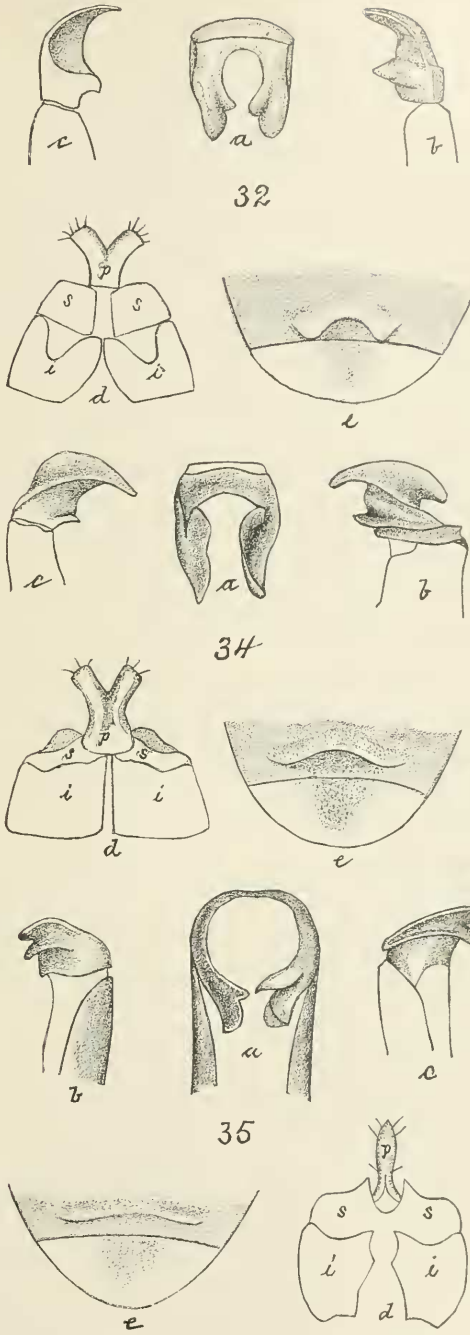
I was not quite prepared for this species, coming as it did from a region from which I had many specimens.* It well illustrates, however, how really slipshod much of the collecting is, even with "good" collectors.

34. L. dubia Smith.

Completely resembles *fusca* in all outward appearance and habitus. The ventral characters of the male must be resorted to for the identification of that sex. As appears from the figure, the ridge is decidedly less curved than in *arcuata*, and more curved than in *fusca*, and is in every respect more distinctly marked than the latter. The primary characters will show, on comparison with the following species, a considerable change of type, which should be followed by a corresponding change in external habitus, but if it is, we have not yet discovered it. In the female the differences of the male become emphasized. The pubic process is broad, stout, somewhat contracted medially, and divided superiorly into two branches which are broad, somewhat flattened, and obliquely truncate. The superior plates are narrow, linear.

This species is in the collection from Massachusetts, New York, New Jersey, Maine, North Carolina, District of Columbia, Illinois, Ohio,

* I have since received it from Chicago, Illinois (Westcott).



SEXUAL CHARACTERS OF LACHNOSTERNA.

32. *L. arcuata*, ♂ and ♀. 34. *L. dubia*, ♂ and ♀. 35. *L. fusca*, ♂ and ♀.

(Explanation of plate on page 524.)

Texas, Colorado, Tennessee, Nevada, Montana, California, Wisconsin. Of all the others this extends furthest west, and the race *cephalica* Lec. belongs to this species. It is fairly numerous at New York, formed a fair proportion of the specimens received from Chicago, Ill., from Mr. Westcott, but is rare at Washington, only a single specimen having been taken during the last season (1888).

35. L. fusca Fröhl.

This is the form which Dr. Horn suggests as likely to be the one seen by Fröhlich, and upon which he based his species. It offers no point of superficial difference from the preceding species, with which it agrees in form, color, size, and general habitus. The ventral character in the male must be examined to recognize that sex, and no difficulty will be found in this. The female is easily distinguished from all its allies by not having the last ventral segment emarginate. This character is at once obvious on examination, and the species is thus readily recognizable in both sexes. A comparison of the figures will show the change in type of genitalia from the preceding. The female shows the greater difference and is somewhat unique, the pubic process being subulate, slender, the superior plates coalescent on the median line.

This species is in the collection from Texas, New York, New Jersey, Ohio, Illinois, District of Columbia, Iowa.

It is the common form around New York City; was the only form found in a large lot of material from Cleveland, Ohio, and was represented in great proportion in a lot of specimens from the vicinity of Chicago, Ill. In the District of Columbia it is very rare, no specimens having been taken at all during the season of 1888, and only a few specimens from the locality are in the local collections.

36. L. grandis Smith.

This species is, as a whole, rather larger than either of the others and rather more robust. The sides of the thorax are very perceptibly subangulate before the middle, giving the species a distinctive appearance which is generally easily recognizable in both sexes. In the female the last segment is emarginate and the middle of the abdomen, especially toward the base, is distinctly and somewhat aciculate punctate. The male character has been sufficiently given in the table. The last ventral segment is granulate punctate. Within my experience this is the rarest of the *fusca* forms, though widely distributed. I have seen it from Texas, North Carolina, Georgia, District of Columbia, Illinois, Colorado, Maryland, New York, Wisconsin, Nova Scotia, Lake Superior region. Mr. Schwarz thinks it more common about Lake Superior than the other species. In the District of Columbia it is rare, only isolated specimens having been found by the local collectors.

The male ventral character differs from that of the allied species in that there is no perceptible curve to the ridge, which is rather prominent and not at all crested or declivous posteriorly. The genitalia of

the male are but slightly dissimilar, strongly resembling the *fusca* type, yet differing greatly in details, as a reference to the figures will readily show.

The female is rather characteristic, differing from all other of the forms by having the pubic process rather slender and furcate—quite different from the broadly bifid processes of *arcuata*, *insperata*, and *dubia*.

37. L. ulkei Smith.

Form robust, ovate, rufocastaneous, shining. Clypeus slightly emarginate, the border moderately reflexed, surface rather closely punctate, front more coarsely and less closely punctate. Thorax widest at base, arcuatedly narrowed to the apex, margin very indistinctly crenulated, with short ciliae; surface distinctly but rather irregularly and not very closely punctured, with a smooth median line. Elytra more deeply and densely, somewhat confluently, punctured, the costæ evident. Pygidium rather finely and sparsely punctate. Metasternum densely punctured, the hair long and dense. Abdomen shining, sparsely punctate. Claws curved, the tooth median, stronger in the female. Last joint of the maxillary palpi ovate, not impressed.

Length, .85 inch, 21–22mm.

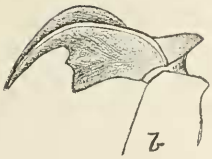
Habitat.—South Carolina, Ulke; Georgia, Ulke; Tennessee, U. S. National Museum; East Florida, Schwarz, 3 ♂, 1 ♀.

Male.—Antennal club as long as the stem, abdomen flattened at middle, penultimate segment with a perfectly straight, feebly elevated ridge, behind which the segment is strongly depressed, making the declivity deep and abrupt without any great elevation of the surface of the ridge. The ridge is close to the margin of the segment, and in the Tennessee specimen almost coincident with it. Last ventral feebly concave. Inner spur of the hind tibiæ two-thirds the length of the outer, and stouter.

Female.—Antennal club small, much shorter than the funiculus. Last ventral segment feebly emarginate at apex. Pygidium more elongate than in the male, more shining, the punctures more sharply impressed.

This species agrees in all essentials and group characters with *fusca*, and with that species it has been confounded. The four specimens before me are very uniform in appearance, and chiefly differ habitally in the paler color and the much more rugose appearance, the punctuation being coarser throughout. The lateral margin of the thorax is also very feebly crenulated, yet not so as to throw the species into another group. The ventral character of the male gives an obvious and safe distinguishing feature for that sex. In the female the somewhat broader, more oval form and the coarser punctuation must suffice.

Mr. Ulke has the male and female; the specimen in the Museum is a male. Another male specimen from eastern Florida, taken by Mr. Ashmead, is in Mr. Schwarz's collection.



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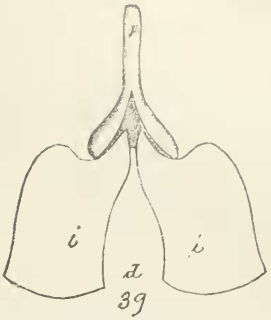

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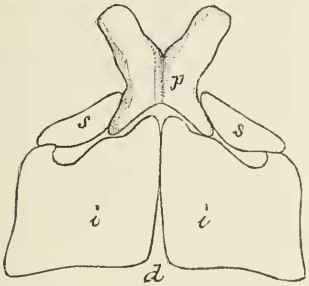

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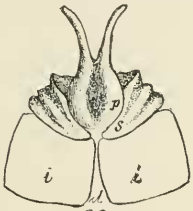

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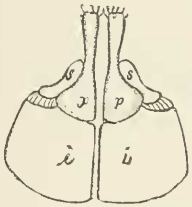

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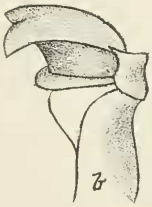

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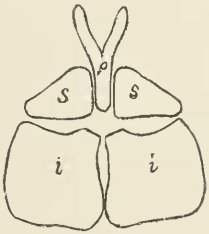


SEXUAL CHARACTERS OF LACHNOSTERNA.

33. *L. insperatus*, ♂ and ♀.
36. *L. grandis*, ♂ and ♀.
37. *L. ulkei*, ♂ and ♀.
38. *L. quadrata*, ♀.
39. *L. polilula*, ♀.
55 *L. longispina*, ♂

(Explanation of plate on page 524.)

Thus far the species seems southern; whether it ranges further north or west, future collections must show.

The genitalia are closely after the *fusca* type, but they are symmetrical. They approach most nearly perhaps in detail to *grandis*. The female is unique, not only for the group, but for the genus. Here the pubic process is distinctly double, the parts slender, parallel, and quite long. The superior plates are quite reduced, and form lateral supports to the pubic process.

38. L. quadrata Smith.

Form oblong, parallel, rather deep brown, shining. Clypeus very feebly emarginate, moderately reflexed, surface coarsely and rather sparsely punctured, front more closely and more deeply punctured. Thorax widest at base, arquately, but not very greatly narrowed to the apex; margin entire, with short ciliæ; surface rather sparsely and irregularly punctate, without an obvious smooth median line. Elytra closely and confluently punctured, the punctures tending to form longitudinal series; costæ obvious but not much elevated. Pygidium sparsely and finely punctate. Abdomen shining, sparsely punctate, the last two segments more coarsely. Claws curved, the tooth strong and median. Last joint of maxillary palpi ovate, not impressed.

Length, .87 inch, 22^{mm}.

Habitat.—Enterprise, Florida, May.

MALE.—Unknown.

FEMALE.—Antennal club small, much shorter than the funiculus. Last ventral segment broadly emarginate at apex.

This species is based upon a single female specimen taken by Mr. Schwarz, and now in his collection. It is evidently related to *fusca*, and agrees with it in all structural details. It is, however, well distinguished by the almost square clypeus, the punctuation of the head and elytra, and by the curiously parallel form.

The genitalia bear out the superficial characters to a remarkable extent, and are unique, though not as peculiar as in *ulkei*. The pubic process is here deeply cleft at tip, but not entirely divided, while the separate tips are divaricate and pointed. The superior plates are rather uniquely corrugated or folded. The discovery of the male would be matter of great interest.

39. L. politula Horn.

Not in the Museum collection. Dr. Horn has but a single specimen of uncertain locality, which he kindly allowed me to study. The genitalia very strongly resemble those of *fraterna*, and offer nothing noteworthy.

40. L. barda Horn.

Not in the Museum collection.* I owe to Dr. Horn the chance to examine both sexes. The genitalia of the male are among the most pecul-

*A specimen of this species has since been sent me by Mr. Linell for name, and this is now in the Museum collection.

iar in the genus. Not only are they strongly asymmetrical, but the peculiar forms of the claspers are entirely indescribable. The female is also very distinctive, and reference is made to the figures for details of the structures.

41. L. marginalis Lec.

One male and two females in the collection. The male we owe to Mr. Schwarz, the females are from North Carolina (J. B. S.), and Missouri (?). (coll. C. V. R.)

This seems not a common species, and is not easily recognized, though very distinct in genital structure. The claspers in the male are strongly asymmetrical and somewhat peculiar. In the female the structure was somewhat distorted and I figured the parts just as they appear in the specimen. Mr. Ulke has the species from District of Columbia, Georgia, Maryland, New York, Illinois.

42. L. spreta Horn.

Not in our collection. Dr. Horn had but two specimens, both males, and from one of these the drawings are made. The claspers are very decidedly dissimilar, and distinctly peculiar in form. They have also, rather aberrantly, the inner side of tip hairy.

43. L. fraterna Harr.

Of the typical form we have 4 ♂, 4 ♀ from New York, New Jersey, southern Illinois (all from coll. J. B. S.).

Of the variety *cognata* we have 5 ♂, 10 ♀; New York, New Jersey, North Carolina, Louisiana, Nebraska (all from coll. J. B. S.).

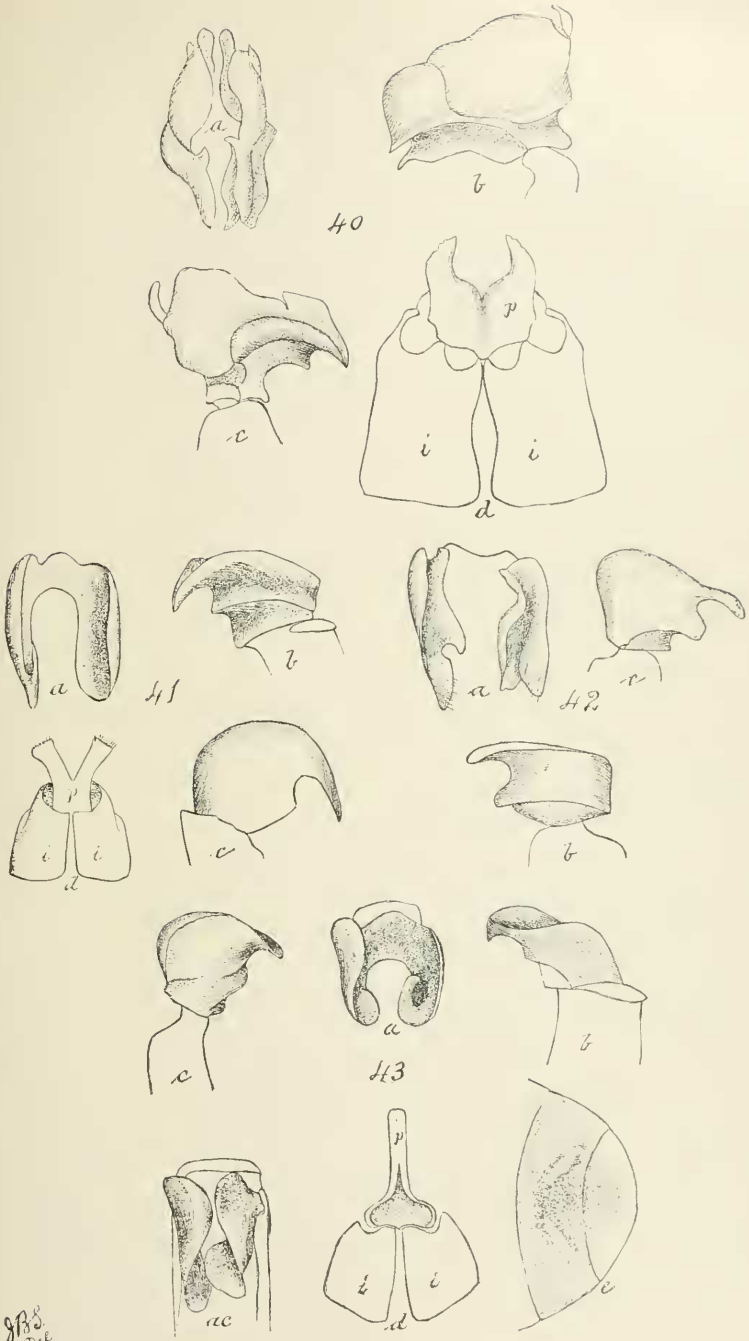
Of the variety *forsteri* we have 1 ♂, 3 ♀, from New York and New Jersey (coll. J. B. S.).

The variety *semi-cribrata* is not represented. Dr. Horn had 2 males, "possibly Georgia."

Our specimens indicate a considerably wider range than that given by Dr. Horn, both to the South and to the West.

In looking over the series in the collection, and in addition the duplicate material, a very strong variability is noted. The size, form, and sculpture differ remarkably, and the polish of the surface is also very inconstant. The male characters also show a decided variation. In some forms Dr. Horn's description applies perfectly, in others there is no distinct elevation, while in the other extreme you may have a perfect arch, always feebly marked at the middle, however. The forms found at Washington differed so strongly that I studied the genitalia of the series carefully with the result that I developed out of specimens referred to the form *forsteri*, a very distinct species.

The genitalia of the male are unusually well developed. The claspers are disproportionately large and very distinctly asymmetrical The figures show two views, the one with the claspers normally open, the other with the claspers closed so far as possible, the specimen having been taken in coitu. The female shows the disappearance of the superior



SEXUAL CHARACTERS OF LACHNOSTERNA.

40. *L. barda*, ♂ and ♀.
41. *L. marginalis*, ♂ and ♀.
42. *L. spreta*, ♂.
43. *L. fraterna*, ♂ and ♀.

(Explanation of plate on pages 524–'5.)

plates, and the expansion of the pubic process, which in the next series becomes so prominently marked in some of the species.

44. L. nova Smith.

Oblong; slightly broader behind; chestnut brown, shining. Clypeus moderately emarginate; the border narrowly reflexed; surface densely and coarsely punctured; the front less densely so. Thorax gradually narrowed from base to apex; sides feebly arcuate; the margin distinctly crenate; surface with distinct, irregular punctures; sparse on the disk, where there are irregular, smooth spaces; more dense and equally at the sides. Elytral punctures finer than those of the thorax; much more closely placed; somewhat rugulose; the costæ feeble, but evident. Pygidium sparsely, finely, and indistinctly punctate. Metasternum densely punctured; the hair not long nor dense; shorter in the female. Abdomen sparsely punctate at the sides, the last two segments more coarsely. Claws curved; the tooth strong and median. Last joint of maxillary palpi fusiform, not impressed.

Length .55–.70 inch; 14–18^{mm}.

Habitat.—New York, District of Columbia, North Carolina.

MALE.—Antennal club equal to or slightly longer than the funiculus. Abdomen slightly flattened at middle; penultimate segment with a distinct, arcuate, granulated ridge, behind which the segment is deeply impressed and punctured. Last segment with a cupuliform depression; inner spur of hind tibiæ shorter and stouter than the outer.

FEMALE.—Antennal club shorter than the funiculus. Penultimate ventral segment with a linear impression close to and parallel with the hind margin. Hind tarsi slightly shorter than the male.

This species is not uncommon at Washington, and has been very generally confused with *fraterna*, var. *forsteri*, with which it agrees in all structural features. Apart from the primary differences in the male genitalia, this sex is always easily recognizable by the distinct arcuate ridge of the penultimate segment. The same character is sometimes approached in the var. *forsteri*, but is never so distinct. The thoracic margin in both sexes is more distinctly crenate, though this, is also indicated in some forms of *fraterna*.

There are several specimens of both sexes in the Museum collection from the localities above named. The genitalia of the male differ from those of *fraterna* most remarkably in size as well as in other details. The claspers are not more than one-half as large, much more frail in appearance, and quite differently built. In the female, on the contrary, I can find no differences from *fraterna*. The genitalia are absolutely alike so far as my observations go, and I have examined a considerable number of them.

45. L. infidelis Horn.

The collection contains two female specimens from Georgia (coll. C. V. R.), presenting nothing at all peculiar. To Dr. Horn I owe the male for study.

The claspers of the male genitalia are very lightly and gracefully built, and very strongly dissimilar. The female characters, on the contrary, are small, and not at all well developed. The figures must be referred to for details.

46. L. hornii Smith.

Oblong oval, not broader behind, convex, very deep brown or piceous, shining; clypeus moderately deeply emarginate, rather more acutely in the female; margin narrowly reflexed, rather coarsely, densely punctured, front scarcely less densely punctured. Thorax distinctly narrower in front; sides very obtusely angulate, widest behind the middle, narrowed to base, more obliquely narrowed in front; margin feebly crenate, sparsely ciliate, disc convex, the punctures moderately coarse, variably placed, sometimes closely and equally, sometimes sparsely and irregularly on the disc, leaving smooth spaces, but no smooth median line, a distinct depression of the basal margin externally. Elytral punctures finer, much more dense, somewhat rugulose, costæ evident. Pygidium moderately and somewhat irregularly punctured, less densely so in the female. Metasternum densely punctured, the hair long and dense in the male, short and sparse in the female. Abdomen finely punctate, more dense at the sides, the last two segments much more coarsely and densely. Last joint of maxillary palpi fusiform, not impressed.

Length .75–.85 inch; 19–21^{mm}.

Habitat—Washington, D. C., Tennessee, Virginia, Ohio.

Male.—Antennal club slightly longer than the funiculus. Penultimate segment with a very strongly elevated, overhanging arcuated crest, occupying nearly the entire length of the segment, behind which there is a deep, transverse punctured impression. In some specimens the crest is divided at the middle, and a longitudinal impression extends forward to the middle of the preceding segment. Last ventral with a quadrate punctured impression, the hind margin with a small deep emargination. Claws arcuate, tooth rather extra median, shorter than the female. The fixed spur is quite short, less than half the length of the outer, and proportionately less stout.

Female.—Antennal club shorter than the funiculus. Pygidium more elongate, the punctures smaller and more sparse. Posterior femora stouter, spurs of hind tibiæ short and stout. Penultimate ventral segment with a strongly impressed line near the hind margin, behind which the segment is depressed. Last ventral segment sinuate at apex, scarcely emarginate. Tarsi not shorter than in the male.

Variations.—In a series of nine specimens no variations are observed. The species is remarkably constant in form and color.

About a dozen specimens of this interesting form were taken at Washington during the present season (1888). None of the local collectors had ever taken it before. As will be seen by the record of captures heading this paper, the specimens were rarely taken. I picked

up one specimen in the morning on a walk in the Smithsonian grounds, badly eaten by ants, and fished another out of a fountain in the White House grounds. Mr. Ulke took two specimens at the electric light. Mr. Schwarz received a single male specimen from the mountains of Tennessee, and Mr. Alwood saw a specimen in a local collection in Virginia. I saw several specimens in Mr. Dury's collection at Cincinnati, Ohio, and the species is probably widely distributed, though rare.

In group characters it would seem at first referable to the *fraterna* section of the *fusca* group, but the large size, very long tarsi, and the marked sexual characters refer it rather with *rugosa* and allies, though the thorax is not as evidently angulated, and the punctures are not nearly so coarse. In the short spur of the male it resembles *infidelis*, while the distinct elytral costæ as well as the male characters make it evidently distinct. I take pleasure in dedicating this strongly marked species to my good friend and mentor, Dr. Horn.

The genital structure is very strongly marked in both sexes. In the male the claspers are very dissimilar and very large. In the female there is a combination of superior plate and pubic process, which is approached but not equaled in other species in this group.

47. L. biimpressa Smith.

Oblong, scarcely ovate, pale reddish-brown, shining. Clypeus moderately deeply emarginate; margin narrowly reflexed, densely and rather coarsely punctured, as is also the front. Thorax distinctly narrower in front; sides obtusely angulate, widest at middle, narrowed to base, more obliquely narrowed in front; margin irregular, scarcely crenate, sparsely ciliate; disk convex, the punctures coarse and rather closely placed, a distinct smooth median line, a distinct impression of the basal margin externally, and a distinct foveate impression at each side nearly opposite the angle; elytral punctuation finer, more dense, somewhat rugulose, sutural costa distinct, the others feeble; metasternum closely punctate, with moderately long hair; pygidium rather sparsely, finely, and irregularly punctured; claws arcuate, with a strong median tooth; last joint of maxillary palpi fusiform, not impressed.

Length, .76 inch; 18^{mm}.

Habitat.—Manhattan, Kans., '76.

MALE.—Antennal club nearly as long as the stem. Abdomen flattened at middle, sparsely finely punctuate at the sides, the last two segments more coarsely. Penultimate ventral segment with a rather feebly elevated, strongly arcuated ridge, behind which the segment is deeply impressed and punctured, last segment with a somewhat quadrate depression.

Only a single male is known to me, the source of which I do not know. It seems to be an old specimen, though in good condition, received at the Department of Agriculture, and used in the exhibition series to represent *fusca*. I have placed it in this group, and associated it with *scitula*, though the specimen has very evidently but nine antennal joints